MORPHOLOGICAL NOTES ON THE LIMBS OF THE AMPHIUMIDÆ, AS INDICATING A POSSIBLE SYNONYMY OF THE SUPPOSED GENERA.

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Little attention has apparently been given to the comparative history of the limbs of the known species of *Amphiuma*. Very young specimens do not seem to have been usually collected for museums. I have had the opportunity to study such a series varying from 6 to 8 inches long, and about $\frac{1}{4}$th inch, or a little more, in diameter; they were obtained in the vicinity of Biloxi, Mississippi, and are the property of the Smithsonian Institution at Washington.

From these it appears that the digital elements of the limbs are variable, or liable to variation in the same individual, so that in some the number of digits (two) is characteristic of *Amphiuma*, and in others (three) they are characteristic of *Muræ nopsis*. This blending of the characters of the two genera may be illustrated as follows, indicating the number of digits on each limb by numerals, arranged in fours, the first pair representing the digital formula of the four limbs, thus: (1) $\frac{2}{2}\ \frac{3}{3}$; (2) $\frac{2}{2}\ \frac{3}{2}$; (3) $\frac{3}{3}\ \frac{3}{3}$; and (4) $\frac{2}{2}\ \frac{2}{2}$; there was also a form which exhibited no outward indication of toes on the front pair of limbs, the digits being inclosed in a common investing integument; this fifth form may be represented in this manner $\left\{\frac{2\ 3}{2\ 3}\right.$. It is plain from the foregoing, that at no very remote period the two forms which are now believed to characterize distinct genera were probably one and the same. The three-toed form (*Muræ nopsis*) is said to be confined to the Southern United States, whilst the two-toed form (*Amphiuma*) is more widely distributed, extending farther north, and also embracing the distribution of the former. The digital formula of (1) is *Amphiuma* in the front pair, and *Muræ nopsis* in the hind pair of limbs; that of (2) is *Amphiuma* on one side in the hinder pair, and *Muræ nopsis* on the other. Normal individuals of both genera also occur, as in (3) and (4); while (5) represents the beginning of the differentiation of a third generic type, if the number of digits be good and sufficient to characterize genera. Prof. Cope, who has probably handled more specimens of *Amphibia* than any other American naturalist, informs me that he thinks these varia-

tions very uncommon, as he has never in his experience met with any instance in which there was as much variation in the number of digits as exhibited in these Biloxi specimens. They can hardly, however, be regarded as monstrosities, as the percentage of varying specimens in this series is entirely too high. I am inclined to believe that they are simply instances on the one hand of reversion toward a still older, and more unspecialized type, and on the other of a tendency to become specialized or reduced, as in the case where the two digits are covered by a common tegumental investment. If the distribution of species will in any case serve to throw light upon the differentiation of genera, I think that in this instance we may assume, with much show of reason, that the individuals most remote from the centre of maximum development of species and individuals exhibit the greatest tendency towards digital reduction. The most northern form, *Amphiuma*, seems to be constantly didactyle, whilst the more southern forms are both di- and tridactyle, which would seem to indicate that the forms most remote from the centre of distribution have been under conditions tending to produce didactylism synchronously with di- and tridactylism at the centre aforementioned. This, however, is only a hypothetical view of the case.

The admission of *Muræ nopsis* and *Amphiuma* to generic rank on account of a difference, which is here shown not to be constant, is doubtful. The digits, which from the fact of their having undergone reduction, seem to be not so much rudiments as vestiges of former digits, render the legitimacy of the distinction even more open to question. For I think it cannot be doubted that such a tendency to degenerate, accompanied with a consequent tendency to produce synthetic characters, shows clearly that nature has not yet concluded that they shall be genera, notwithstanding the dicta and definitions of systematists.